REDUCED-PROFILE SLIDE AND LOCK STENT

INCORPORATION BY REFERENCE TO ANY PRIORITY APPLICATIONS

This application claims from the benefit of U.S. Provisional Application No. 61/785,914, filed Mar. 14, 2013, titled "REDUCED-PROFILE SLIDE AND LOCK STENT," the entirety of which is incorporated herein by reference.

RELATED APPLICATIONS

In certain respects, this U.S. patent application is related in subject matter to U.S. patent application Ser. No. 13/083,508 filed Apr. 8, 2011, which claims priority to U.S. Patent Application No. 61/322,843, filed Apr. 10, 2010. In some respects, this application is also related in subject matter to U.S. Pat. No. 7,947,071. Each of the aforementioned patents and applications is incorporated herein by reference.

BACKGROUND

1. Field

The present disclosures relate generally to expandable medical implants for maintaining support of a body lumen, and more specifically, to a uniform stent having improved mechanical and post-deployment dynamic capabilities.

2. Description of the Related Art

Various embodiments of vascular implants; such as stents, thrombus filters, and heart valves, are used in their various embodiments for medical applications. Of these vascular devices, one of the leading candidates as a stent device and structural component is the radially expandable and slidably engaged stent as disclosed in commonly owned U.S. Pat. No. 6,033,436; U.S. Pat. No. 6,224,626; and U.S. Pat. No. 6,623,521; the disclosures of which are hereby incorporated by reference in their entirety. These radially expandable and slidably engaged stents offer the strength of prior expandable stents with the added improvements of low cross-section deliverability, less bulk material thickness, high resolution fitting, and shape customization such as hourglass-shape configurations.

Other radially expandable and slidably engaged stents; such as those disclosed in U.S. Pat. No. 5,797,951; U.S. Pat. No. 5,549,662; and U.S. Pat. No. 5,733,328; further describe the state of the art and their disclosures are hereby incorporated by reference.

Although promising candidates for use as implantable devices and device components, these known radially expandable and slidably engaged stents have mechanical and vasodynamic limitations of which the inventors of the present application set out to address. These limitations can be characterized as deployment related limitations, and limitations related to vasodynamic capabilities.

Deployment related limitations of prior art stents are herein described. Intravascular space; especially that of a patient in need of a vascular implant, is generally inconsistent and varies upon the individual with respect to curvature, plaque buildup and other luminary obstructions. Furthermore, the shape and structure of the stent may impact the rate and order that discrete areas of the stent deploy, e.g., expand. For instance, one portion of the stent may expand prior to a second portion of the stent. Such inconsistent and/or non-uniform deployment may render deployment and placement of prior art stents more difficult and less predictable.

Procedures are available to physicians such as balloon angioplasty, which aid in the reduction of plaque prior to stenting. However, even after such procedures, vascular characteristics remain patient delineated and largely inconsistent. Inconsistencies in vascular characteristics; such as the interference due to a luminary occlusion, require flexibility, distribution of material strength, and vascular adaptability of devices to be implanted.

SUMMARY

In accordance with at least one of the embodiments disclosed herein is a realization that the configuration of a vascular implant, such as a stent, affects the deployment characteristics of the implant. For example, the shape and structure of the stent may impact the rate and order that discrete areas of the stent deploy, e.g., expand. For instance, based at least in part on the characteristics of the stent, one portion of the stent may expand prior to a second portion of the stent. In some embodiments, the stent can be designed with characteristics such that the stent advantageously deploys substantially equally along a longitudinal length of the stent. Accordingly, various embodiments disclosed herein provide a stent that can be deployed or expanded in a generally uniform manner without binding.

Further, in accordance with at least some embodiments disclosed herein is the realization that a helical stent can often experience binding or deployment problems as the helical arrangement unwinds, which must occur from either or both ends of the helical stent. As a result, expansion in the center of the helical stent delayed until the helix is "unwound" from its ends. These expansion characteristics are unsatisfactory as they provide nonuniform deployment and structural properties. Accordingly, in order to address these deficiencies, the inventors of the present application have developed various embodiments of a reversing helical stent having a reversing helical backbone that advantageously provides vastly improved deployment and structural characteristics. Further details such embodiments are provided herein, and can incorporate various features, structures, material configurations, and other attributes such as those disclosed in the copending U.S. patent application Ser. No. 12/577,018, filed Oct. 9, 2009, titled "EXPANDABLE SLIDE AND LOCK STENT," the entirety of which is incorporated herein by reference.

Further, in accordance with some embodiments is the realization that the shape and structure of a stent can impact whether the stent undergoes a twisting or rotation about a longitudinal axis of the stent during deployment. In certain instances, it can be advantageous to reduce or minimize the twisting of a stent during expansion, e.g., to facilitate expansion of the stent by reducing friction between components of the stent and/or between the stent and the vasculature. For example, the stent can include a longitudinally-extending structure (e.g., a backbone or backbone member) that can extend at least partially (e.g. helically) around a circumference of the stent. In some cases, such a configuration can promote deployment, provide torsional flexibility, and reduce twisting of the stent. As disclosed herein, embodiments are disclosed herein that enable such a configuration to not only provide portable flexibility, but to also provide reduced binding of the stent during deployment.

In accordance with some embodiments, the stent can comprise at least one backbone coupled with at least one rail member. The backbone can generally extend along a longitudinal axis of the stent. The rail member can generally extend in a circumferential direction of the stent. Thus, the rail member can define a portion of a circumference of the tubular